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Ten species of Collembola from Baltic amber

ABSTRACT: Ten species of Collembola are recorded from Baltic amber in the collection of the Museum of the Earth. These species are compared with recent taxa. Four species represent genera recorded as fossils for the first time.

INTRODUCTION

The present work is based on the collection of the Museum of the Earth of the Polish Academy of Sciences, Warsaw. There are 54 specimens of Collembola in 50 slices of Baltic amber (age c. 35—40 million years). The amber comes from the Holocene fossil beach sediments at a depth of 12 or more metres, in Gdańsk-Stogi (coll. by Tadeusz Giecewicz).

The fossils are all in adequate condition for identification to recent genera but the more minute characters, necessary for specific identification, are either distorted, obscured or missing. The fossil Collembola have been compared with the recent species that they most closely resemble. The present material is similar to and perhaps even conspecific with recent species. Four species represent genera recorded as fossils for the first time.

DESCRIPTIONS

Order **Collembola** Lubbock, 1873
Suborder **Arthropleona** Börner, 1901
Family **Hypogastruridae** Börner, 1913
Genus **Hypogastrura** Bourlet, 1839
Subgenus **Hypogastrura (Ceratophysella** Börner, 1932)
Hypogastrura (Ceratophysella) sp.

Material. The single specimen is embedded in a slice of amber, Museum of the Earth, inventory No. 18010.

Description. Length 0.5 mm. Third and fourth antennal segments with indication of an intermediate, eversible sac, characteristic of subgenus *Ceratophysella*. 8 ommatidia present each side of head. Anterior body macrosetae approximately the same length as their segments. Sixth abdominal segment shorter than its macrosetae. Pair of anal spines present on papillae.

Remarks. *Hypogastrura (Ceratophysella)* species are common in humus and fungae. They often swarm and are trapped on rain-water puddles.

Subgenus **Hypogastrura (Schoettella** Schäffer, 1896)
Hypogastrura (Schoettella) cf. **ununguiculata** (Tullberg, 1896)

(Pl. II, 8)

Material. The single specimen is embedded in a slice of amber, Museum of the Earth, inventory No. 18008.

Description. Length 1.0 mm. 8 ommatidia visible on left side of head. Empodial appendage absent. Right metathoracic leg with 6 tenent hairs of which 2—3 can be seen on other legs. No outstanding macrosetae visible. Traces of granulate regions between the dorsum of body segments. A pair of anal spines on papillae are shorter than the claw.

Remarks. *Hypogastrura (Schoettella) ununguiculata* is reported by Stach, 1949: 183—186, to be especially common under conifer bark. Stach records the adults as hibernating and appearing in large numbers in Spring. This is the first record of a fossil species of this subgenus.

Family **Neanuridae** Börner, 1901
Genus **Pseudachorutes** Tullberg, 1871
Pseudachorutes sp.

Material. 2 specimens embedded in a slice of amber which also encloses 2 mites, Museum of the Earth, inventory No. 18006.

Description. Length 0.45—0.55 mm. 8 ommatidia on each side of head of smaller specimen. At least 3 clavate tenent hairs on mesothoracic tibiotarsus of larger specimen. Furca of larger specimen about as long as the 4th abdominal segment, a little shorter than the ventral tube is broad. Anal spines absent.

Remarks. This species resembles the arboreal *Pseudachorutes boerneri* Schött, 1902, or *P. corticicolis* (Schäffer, 1896). Both of these species have clubbed tenent hairs, a feature of Collembola that climb. This is the first record of a fossil species of this genus.

Family **Isotomidae** Börner, 1913
Genus **Tetracanthella** Schött, 1891
Tetracanthella sp.

Material. 2 specimens embedded in the cloudy central portion of an otherwise clear slice of amber together with a *Tomocerus* sp., Museum of the Earth, inventory No. 18007.

Description. Length 0.8 mm. Both specimens are in poor condition and obscured by impurities in the amber. However one specimen shows 4 anal spines characteristic of this genus. The segmentation of antennae and body, as far as can be seen, is typical of *Tetracanthella*.

Remarks. Some *Tetracanthella* species, including the widely-distributed *T. wahlgreni* Axelson, 1907, are common on and under conifer bark. This is the first record of a fossil species of this genus.

Genus **Isotoma** Bourlet, 1839
Isotoma sp.

Material. 4 specimens embedded in 4 slices of amber, Museum of the Earth, inventory Nos. 18009, 18012, 18013, 18014.

Description. Length 0.5—0.55 mm. The 4 specimens possibly represent the same species, characterised as follows, though not all the characters can be seen on all the specimens. 8 ommatidia appear to be present on each side of the head. Antennae about as long as head with 4th segment bulbous, broader than the 3rd. Mesothorax longer than metathorax. 6th abdominal segment reduced, hidden by 5th or perhaps even fused to it, in which case the species belongs to the subgenus *Pseudisotoma*. Body setae in up to 6 transverse rows with macrosetae at 90° to body, as long as the segments from which they arise. Some posterior setae stout, almost spinose or serrate. Dens curving, crenulate with bidentate or tridentate mucro shorter than claw.

Remarks. Similar modern species are those in the subgenera *Pseudisotoma* or *Vertagopus* which are presumed to have evolved from *Isotoma* species without tenent hairs or fused abdominal segments.

Family **Tomoceridae** Börner, 1913
Genus **Tomocerus** Nicolet, 1842
Tomocerus cf. **minor** (Lubbock, 1862)

(Pl. II, 5, 6)

Material. 4 specimens embedded in 4 slices of amber, Museum of the Earth, inventory Nos. 18007, 18011, 18016, 18020.

Description. Based on specimen 18011. Length 1.8 mm. Fourth antennal segment distinctly annulated, with fine setal whorls. 6 ommatidia can be resolved on left side of head. A conspicuous collar of setae is present protecting the membranous area between head and thorax. These setae are considered by some workers to be extra setae of the anterior margin of the mesothorax which has increased in size following the dorsal reduction of the prothorax. Other workers suggest that these setae are those of the prothorax which is fused to the mesothorax. Unfortunately the morphology of the specimens in the amber is too similar to that in recent *Tomocerus* for either hypothesis to be positively verified. Claw with external teeth and at least 2—3 internal teeth. Each dens with 7 black, trifid spines. Mucro with several teeth. Scales with parallel striations, particularly visible dorsally.

Remarks. Specimens 18007, 18016 and 18020 are 2.0, 1.8 and 1.0 mm long but are in unsuitable condition for fine details to be resolved. However they are provisionally referred to the same species as the better specimen 18011. *Tomocerus minor* (Lubbock, 1862) is common on rotten tree stumps and has similar dental spines to those of the fossil specimen.

Family **Entomobryidae** Börner, 1913
Genus **Orchesella** Templeton, 1835
Orchesella sp.

(Pl. II, 7)

Material. 2 specimens embedded in 2 slices of amber, Museum of the Earth, inventory Nos. 18027, 18032.

Description. Length 1.5—1.7 mm. The shorter specimen has a downward flexed head which cannot be measured. This specimen may be nearer the longer in total length. The specimens appear to have only 2 antennal segments, but each is subdivided into 2 so that 4 segments are actually present. Recent *Orchesella* species have 6 antennal segments of which the apical 2 are liable to

break off. The truncate apices of the terminal antennal segments of the fossil specimens indicate that the apical segments have broken off.

Remarks. Recent *Orchesella* species are more common in surface litter than up trees but *Orchesella cincta* is found on tree stumps and in birds' nests.

Genus **Lepidocyrtus** Bourlet, 1839
Lepidocyrtus sp.

Material. 3 specimens embedded in 2 slices of amber, Museum of the Earth, inventory Nos 18034, 18045.

Description. Lengths 1.0, 1.8, 2.1 mm. The condition of the specimens is such that their identification and conspecifity is doubtful. They are scaled Entomobryids similar in general fascies to that of recent *Lepidocyrtus*. Specimen 18045 has the dens about 25% longer than the manubrium, while in the common European species *L. lignorum*, these segments are of similar length.

Remarks. Species of *Lepidocyrtus* are now separated on small differences of mouth-part and abdominal chaetotaxy. These characters cannot be seen in the amber material.

Genus **Entomobrya** Rondani, 1861
Entomobrya sp.

(Pl. I, 3, 4)

Material. 35 specimens embedded in 35 slices of amber, Museum of the Earth, inventory Nos. 18015, 18017—18019, 18021—18026, 18028—18031, 18033, 18035—18044, 18046—18055.

Description. Length up to 1.8 mm. Average length of 30 measurable specimens 1.2 mm. Average length of 23 presumed to be adults 1.4 mm. Antennal segment ratios of 13 specimens on which these could be measured, ranged from 7—16 : 17—33 : 21—31 : 31—48%; average 12 : 25 : : 26 : 37%. Scales absent. Ommatidia number on each side of head not clearly resolved but 6 can be seen on specimen 18028 and the extent of dark pigment on the head of this and other specimens suggests that a total of 8 are present. Specimen Nos. 18039 and 18052 with a trace of a separate tibia and tarsus having femur : tibia : tarsus ratios of 40 : 46 : 14% and 35 : 48 : 17%. 10 specimens with abdomen IV from 35—57% of body length; average 47%. 18 specimens with curving, crenulate dens, 5 specimens with manubrium : : dens ratio of 35—47 : 53—65; average 42 : 58%. 9 specimens with bidentate mucro.

Remarks. The relative length of abdomen IV, averaging 47% of the body, is conspicuously greater than most recent *Entomobrya* where abdomen IV is nearer 27% of the body length. In the recent species *E. muscorum, E. elegans* and *E. superba,* Stach figures the 4th abdominal segment as being from 44—45% of the body length, within the range and near the average of that of the amber material. The latter 2 species are rarely collected, but Stach reports the variable species *E. muscorum* from various biotypes, including East European forests and the Baltic shore. Most collembolan legs, distal to the femur have a single segment, the tibiotarsus, which is presumed to be the result of fusion between tibia and tarsus. However specimens of *Entomobrya muscorum* from Berlin and from Kent, England, have a separate tibia and tarsus, similar to that of the amber material. A separate tibia and tarsus was also found on tropical and North American *Entomobrya* species and on some Paronellidae, though it is not mentioned in descriptions. A trace of the tibiotarsus comprising 2 parts has been reported in some species of Collembola, for example *Cryptopygus (Isotomina) thermophilus.* In this species, the tibiotarsus has been described as subsegmented. The presence of a separate tibia and tarsus on the amber *Entomobrya* implies that it may be misleading to refer to a bipartite tibiotarsus as subsegmented. It is possible that some Collembola have evolved from long-legged ancestors with a separate tibia and tarsus. The fusion of these segments into the tibiotarsus of most recent Collembola may have followed the shortening of legs adapting to a less active, sub-surface existence.

Suborder **Symphypleona** Börner, 1901
Family **Sminthuridae** Lubbock, 1862
Genus **Sminthurinus** Börner, 1901
Sminthurinus sp.

Material. The single specimen is embedded in a slice of amber, together with a single specimen of an *Entomobrya* species, Museum of the Earth, inventory No. 18042.

Description. Length 0.4 mm. Colour black, 3rd antennal segment with basal papilla. On each side of head about 8 ommatidia on raised, intersected dome of granules possibly representing further obsolete facets of the ancestral compound eye. Traces of thoracic segmentation present. Tibiotarsus with tenent hairs minutely clubbed.

Remarks. This is the first record of a fossil species of this genus.

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PETER N. LAWRENCE

Dziesięć gatunków skoczogonków (Collembola) z bursztynu bałtyckiego

Streszczenie

Zbadano 54 inkluzje z 50 płytek cienkich trzeciorzędowego bursztynu bałtyckiego (wiek 35—40 mln lat) pochodzącego z holoceńskich osadów kopalnej plaży w Gdańsku-Stogach (coll. Tadeusz Giecewicz). Opracowano 10 gatunków skoczogonków (Collembola), wśród których 4 gatunki reprezentują rodzaje po raz pierwszy stwierdzone w stanie kopalnym.

Nie zawsze dobry stan zachowania wszystkich okazów pozwolił na porównanie ich jedynie ze współczesnymi gatunkami najbardziej do nich zbliżonymi.

Wszystkie okazy bursztynu z opracowanymi inkluzjami skoczogonków pochodzą ze zbiorów Muzeum Ziemi PAN w Warszawie (nr inw. 18006—18055). (*Red.*)

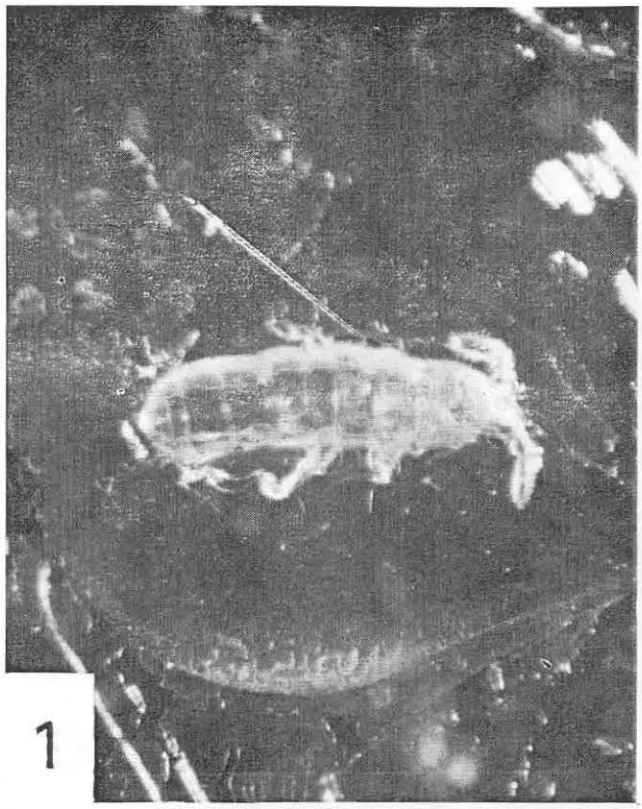
EXPLANATIONS OF PLATES

Plate I

1 — *Isotoma* sp. Inventory No. 18014, *2* — *Isotoma* sp. Inventory No. 18013, *3* — *Entomobrya* sp. Inventory No. 18039, *4* — *Entomobrya* sp. Inventory No. 18049

Plate II

5 — *Tomocerus* cf. *minor* (Lubbock, 1862), Inventory No. 18020, *6* — *Tomocerus* cf. *minor* (Lubbock, 1862), Inventory No. 18011, *7*— *Orchesella* sp., Inventory No. 18027, *8* — *Hypogastrura (Schoettella)* cf. *ununguiculata* (Tullberg, 1896), Inventory No. 18008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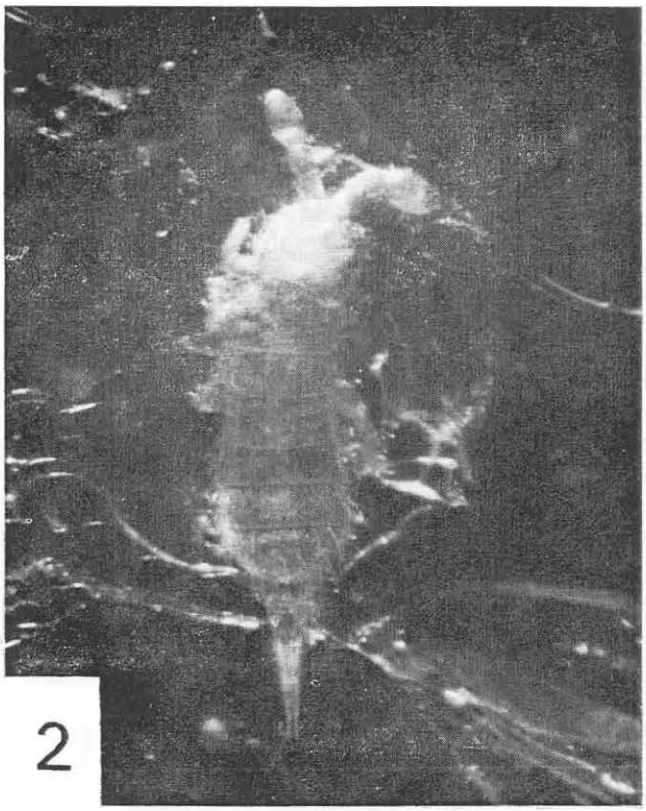
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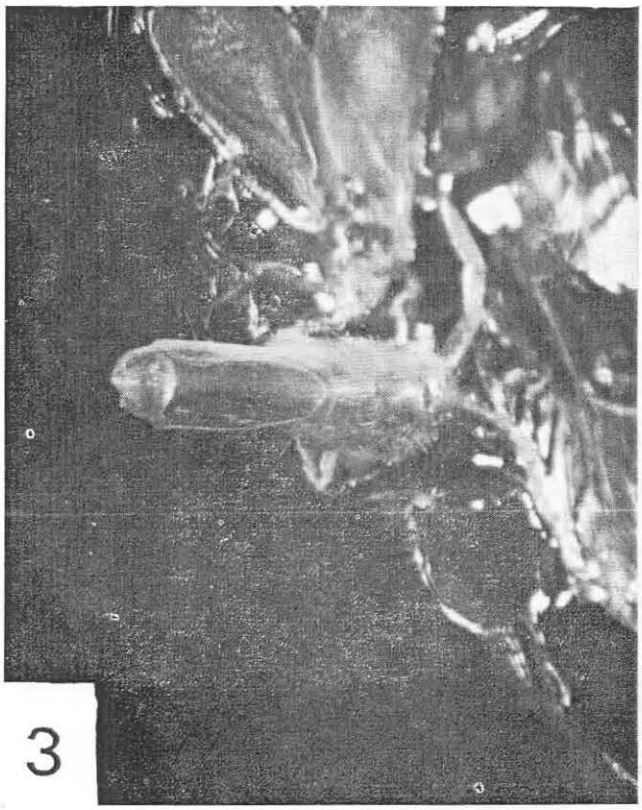
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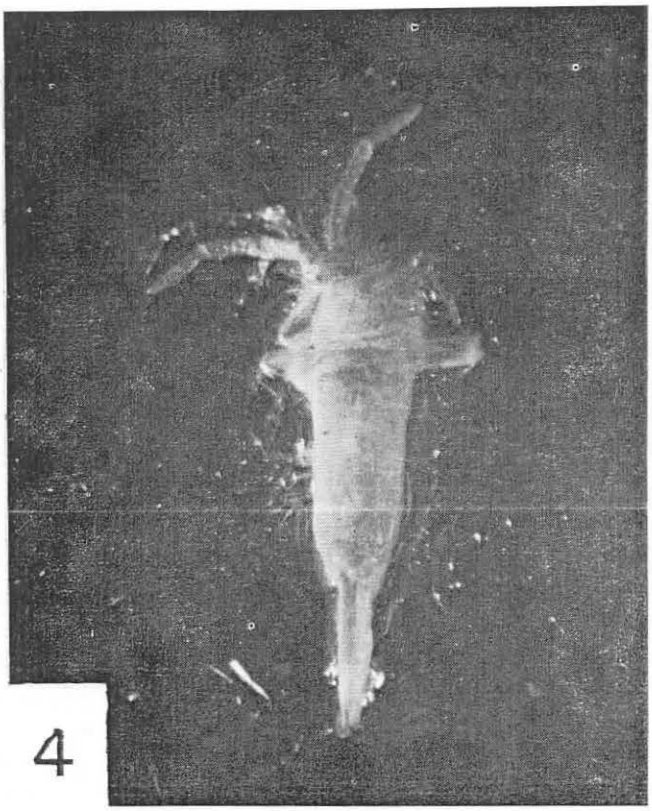
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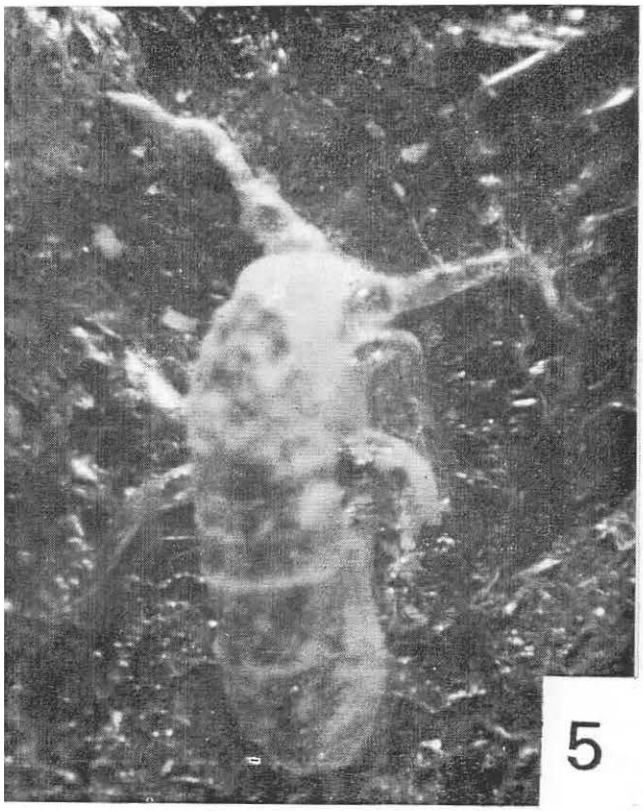
P. N. LAWRENCE — The species of Collembola from Baltic amber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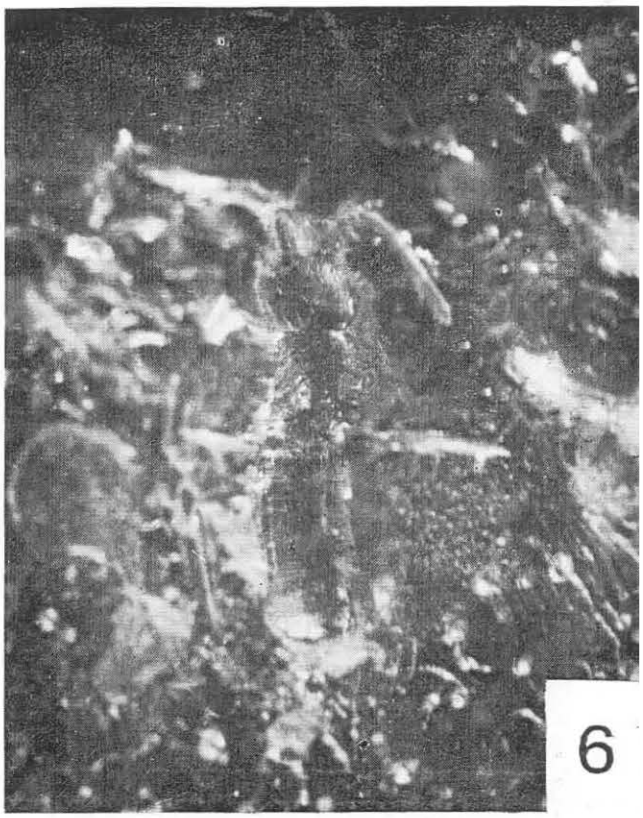
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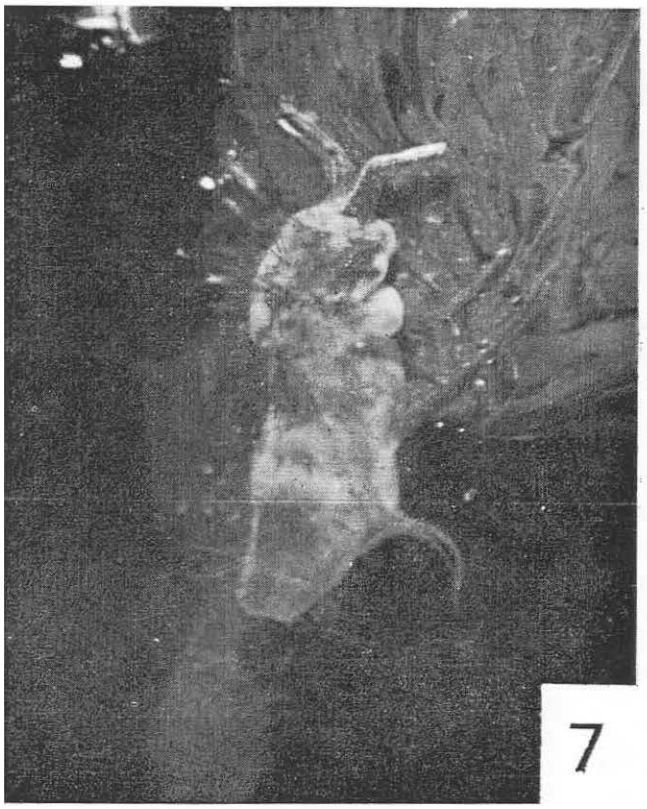
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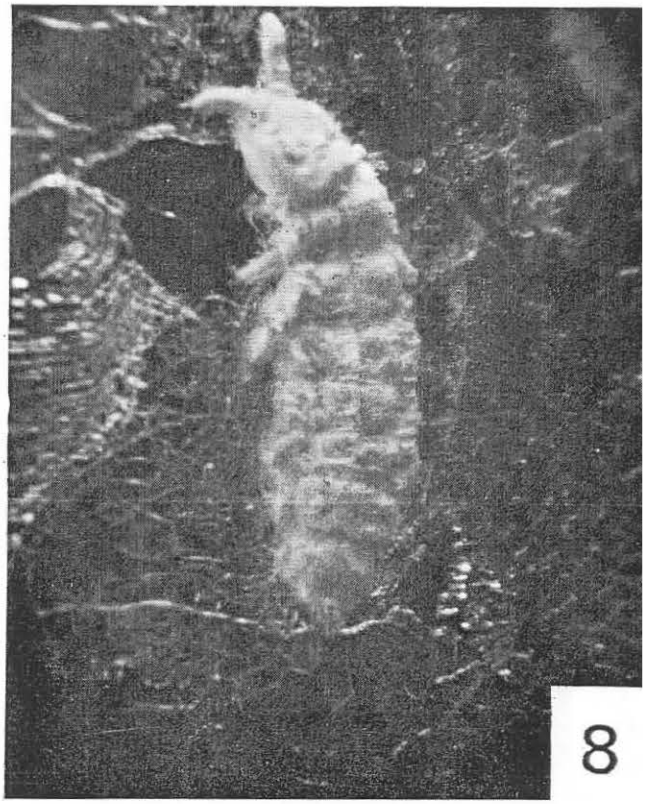
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